

## **CHAPTER 17**

### **COST ESTIMATES**

**17-1. METHODS OF ESTIMATING.** All projects, for which design is initiated, are supported by programmed cost estimates. The method(s) used to prepare estimates for the various required submittals will be as specified in the A-E contract. The A-E will make all necessary investigations, evaluations, calculations, and adjustments to insure that estimates fit the specific project scope and conditions and are current, accurate, and complete. Further detailed instructions and specific information will be provided separately as necessary. All latest revisions and updates of M-CACES Gold software will be provided by the Cost Engineering Branch and will be accompanied by its user's manual. No exceptions to using M-CACES Gold will be allowed without written permission of the Chief, Cost Engineering Branch, USAEDH.

#### **17-2. REFERENCE PUBLICATIONS**

- a. M-CACES Gold User's Manual
- b. TM 5-800-2, Cost Estimates: Military Construction
- c. ER 1110-3-1300, Military Programs Cost Engineering
- d. EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule

#### **17-3. ESTIMATOR QUALIFICATIONS**

It is imperative that estimates be prepared by, and reviewed under the supervision of, personnel who are competent in cost estimating. Estimators must possess a working knowledge of the work to be performed and be capable of making professional determinations based on experience. If the A-E firm determines its staff does not possess all these qualifications, the firm will obtain assistance from a qualified firm whose specialty is cost estimating. In making this determination, the A-E will consider the complexity of the project and the number and qualifications of his full-time estimators. In consideration and selection of a consultant firm for cost estimating, the A-E will consider, in addition to the foregoing, the firm's specialties, its ability to coordinate the estimates with the A-E, and its previous experience in preparing cost estimates for the Government. Estimates prepared by a consultant must be reviewed by the A-E before submittal to insure coordination and compliance with contract requirements.

**17-4. SUBMITTAL REQUIREMENTS.** The A-E will prepare (or have prepared by an estimating consultant) a professional-quality cost estimate at each of the various stages of project design. Estimates must accurately reflect the scope and features of work shown on the design documents actually submitted. The degree of detail must be commensurate with that represented by the submitted plans, specifications, design analyses, etc. In cases where the design is not sufficiently complete to enable accurate definition of any portion of the work, appropriate allowances, based on good estimating experience and judgment, must be made to cover work not yet defined.

**a. Cost Control.** Funds for a project are usually programmed based on the estimated cost at the concept design stage. Based on the programmed amount, which frequently cannot be increased, a Cost Limitation (CL) is determined. The A-E is responsible for making every reasonable effort to design a project that can be built within the CL. Throughout the entire design period, close coordination between the designer and cost engineer must be exercised to insure accurate cost control.

**b. Format.** Project information will be input so that the final design estimate will be in compliance with the work breakdown structure (WBS) as referenced in ER 1110-3-1300. Bid schedule requirements will also be considered. Within bid items, M-CACES Gold facility procedures will be used as practicable to group tasks by trade, e.g., masonry, plumbing, fire protection, sprinkler systems, telephone system, and interior electrical work. The M-CACES Gold System, after project and crew data is input, will compute costs and produce the estimate. No summaries are to be suppressed without prior Government approval in each instance.

**c. Bid Schedule.** For concept submittals, estimated contract costs will conform to a bid schedule similar to that expected to be developed later with a minimum of at least one bid item for work within any building and at least one to cover exterior work. For later-than-concept submittals, estimates will conform to an acceptable bid schedule proposed by the A-E (or imposed by the Government). Generally, each different building or building type must be covered under a separate item. Within a building, selected features or work items may be required to be covered under separate bid items for cost accounting or other reasons. Exterior work may be required to be broken into separate bid items where quantities of work are significant and highly variable or where useful historical cost data can be derived from analysis of bids received. The estimate will present a total amount for each bid item to include direct labor, material and construction equipment costs, indirect costs and profit. The final bid schedule will be as directed or approved by the Government. If the estimated cost of the total project, including cost growth allowances, would exceed the CL, it may be necessary that the bid schedule include items under a base bid and additive alternates. Where additional bid item breakdown beyond that proposed by the A-E is considered necessary, it will be provided by the A-E at no additional cost to the Government. Guidance regarding bid item breakdown may be obtained by contacting, through Corps of Engineers project managers, the Huntsville Division, Cost Engineering Branch. Estimates for modifications under an existing contract must conform to the contract pay item schedule.

**d. Contractor Type.** The estimate will be structured according to the type contractor considered most likely to bid as prime. For example, if the job is so heavy in mechanical work that most bidders would likely be mechanical contractors, the estimate should reflect a mechanical prime contractor.

**e. Cost Breakdown.** Costs must be broken down into priceable elements. All cost and quantities in the estimate must be supported. Unsupported lump sum pricing is not acceptable at any stage of design beyond concept. The level of breakdown must be commensurate with detail available from the design documents.

**f. Concept Estimates.** The estimate should be as detailed as the level of design will permit. Lump sum unit pricing which includes all direct labor, material and equipment costs, and any subcontractor markups, will be permitted up through the concept submittal, provided appropriate.

**g. Estimates Later Than Concept.** Estimates prepared later than concept stage will be recorded on M-CACES Gold in task-by-task detail to accurately reflect the scope of work shown in the submitted documents. At the final submittal since design is nearly complete, the scope of work is sufficiently defined to permit reasonable, accurate and complete determination of all project costs. Therefore, the ready-to-advertise estimate will be an update of the final submittal.

**h. Resubmittal and/or Support.** If after review, any submitted estimate is found to be noncompliant with the requirements stated or referenced in these instructions, the A-E will promptly revise and resubmit the estimate at no additional cost to the Government. If cost, quantity, etc., of any item in the estimate appears questionable, the A-E will provide sufficient explanation and/or supporting data.

**17-5. TECHNICAL REQUIREMENTS.** Estimates must accurately reflect the project scope and conditions, local labor situation, prices of material, labor costs, and construction equipment anticipated or forecasted to prevail in the project vicinity at the time of construction. The estimate should consider delivery dates for materials and equipment to be installed. Very close coordination and clear communication among the A-E designers and estimators is required because reliable, accurate estimates cannot otherwise be produced.

**a. Quantity Survey.** Accuracy and completeness of the quantity survey (takeoff) is essential as it directly and critically affects the accuracy of the estimate. The takeoff will be comprehensively and accurately prepared to cover all work for the project. It will be based on all facts that can be gathered from the available engineering and design data. Assumptions concerning details which are beyond the level available at the current stage of design are often necessary to insure that total cost of the overall project work is covered. In such cases, statements and explanations of necessary assumptions will be included so that, when design details become available, quantities can be reconciled. Quantity surveys must be planned to fit the pricing for the work involved, conform to the bid schedule, and be consistent with the payment provisions of the specifications. Surveys must be documented in such a manner that computations can be followed later and verified by others. Tabulation and computation sheets will be dated and will contain appropriate references to plans, specifications, or design analyses.

Relevant sketches will be included. Quantity survey documentation must be furnished as a part of the estimate submittal to be reviewed by Huntsville Division, Cost Engineering Branch.

**b. Material Pricing.** When an item of material is relatively minor or not yet fully defined, as at concept stage, it will be satisfactory to base pricing on data contained in estimating handbooks (including the M-CACES data base). In these cases, appropriate adjustments must be made to account for project conditions. At later stages or for significant items, material costs will be based on quotations obtained from manufacturers and suppliers, price lists appropriately discounted, and previous recent quotations. Specific current price quotations (at least two, if practicable) should be obtained for major items of permanent equipment and for significant, unusual or nonstandard material items. Where quantities or unit costs will have only moderate impact, recent reliable quotations from other projects on comparable items are considered acceptable. Freight costs to the project site must be covered. Sales and other applicable taxes must be included in the estimate by applying, in a separate calculation, appropriate percentage markups of material cost. Each submittal for which quotations are appropriate will include a list showing principal items of material,

equipment and supplies (such as concrete, structural steel, siding, pumps, chillers, uninterrupted power system, etc.), and indicate the manufacturer/supplier, location, person contacted, telephone number, date, pricing, etc., along with all other pertinent information collected or prepared for the estimate. A record of the pricing data used must be maintained and submitted as backup data with the estimate.

**c. Labor.** Labor costs in the estimate must be based on rates that include basic wages, overtime and holiday premium payments, and contractor's contributions for fringe benefits such as health and welfare, holiday and vacation pay, pension fund, apprentice training, etc. Estimated rates should be those which the contractor will be expected to pay when the work is actually performed and must consider prevailing rates actually being paid in the project area. The rates will be no less than those in the Davis-Bacon or Walsh-Healey Act. Information on wages may be available from various sources, such as Corps field offices, other contractors in the project area, etc. See appendix A, figure A-4 for the applicable form.

(1) Units costs

(a) General. Labor unit costs should be based on estimated productivity and cost of wages, fringe benefits, etc., for the labor involved. Productivity estimates are based on experienced rates, tempered by estimators' judgment, and must consider project conditions, labor availability, market conditions, and the like. Useful information can be obtained from vendors, subcontractors, and other pertinent sources.

(b) M-CACES Gold. For M-CACES Gold estimates, labor unit cost is a function of the crew unit cost and the value for crew daily output included for each task. The productivity rates in the M-CACES Gold data base must be adjusted for project conditions as appropriate. Crews and productivities must be developed by the estimator and should reflect actual work experience. When using a nonstandard M-CACES Gold crew, a DA Form 5419-R should be included in the estimate. See appendix A, figure A-5 for the applicable form.

(c) Social Benefits Cost. The contractor's cost for Social Security taxes (FICA), Federal and State Unemployment Insurance, Workmen's Compensation and Employer's Liability Insurance, and any other social benefits must be included in the estimate as a percentage of the labor costs.

**d. Construction Equipment.** For M-CACES Gold estimates, costs for construction equipment and tool costs are included in the crew costs in the data base. These costs are thereby included by the system for each task, as appropriate. The estimator must determine the appropriate equipment to be used for each crew based upon experience. Crews shown in the M-CACES Gold data base should not be used without verification by the estimator of crew size, equipment use, and productivity. EP 1110-1-8 is the basis for M-CACES Gold equipment unit costs and will be used as well for estimating equipment costs for concept estimates. Sometimes extraordinarily large numbers, or highly specialized, unusual or unique items of equipment may be required. In any instance where it is considered likely that the contractor would have to rent certain equipment, rental rates should be determined for those items and appropriate adjustments included in the estimate to cover any additional cost.

**e. Subcontract Work.** Estimates will be prepared for subcontract work using the same methodology and degree of detail for direct costs as outlined for work by the prime contractor. The subcontract estimate will include costs for direct labor, materials, equipment, and second-tier subcontracts, as well as subcontractor mobilization and other indirect costs and profit. A subcontractor's overhead usually bears a fairly stable relationship to the subcontractor's portion of the work and can be estimated on a percentage basis. Overhead rates typically range from 10% to 15% and profit rates from 7% to 10%, depending on complexity, risk, etc. Judgment must be exercised in selecting appropriate rates. For second-tier subcontract work, overhead and profit markups must be covered for second-tier as well as first-tier. A detailed derivation of subcontractor's overhead costs will be required where his work has unique requirements or where the cost impact of the subcontracted work is significant. When reliable subcontractor quotations are obtained, they may be used to verify the reasonableness of the estimate for the subcontract work.

**f. Mobilization and Demobilization Costs.** These costs must be estimated by detailed analysis considering equipment requirements, distance to move to project site, transportation methods, effort required to prepare, service, load, unload, etc., and the detail included in the submittal. For most projects, mobilization and demobilization for the prime contractor may be included in the estimate of indirect costs. Subcontractor mobilization and demobilization costs should be included in the estimated subcontract total. Where costs apply primarily to certain work items, e.g., for specialized equipment, they should be appropriately distributed to applicable items.

**g. Indirect Costs**

(1) General. For concept estimates where direct cost items may be estimated by experienced unit prices, use of empirical markups for prime contractor is acceptable. For later-than-concept estimates, all field indirect costs for the project must be estimated in detail and then distributed logically to the various items in the bid schedule. Home office expense will normally be prorated to all bid schedule items.

(2) Field Indirect Costs. These include such costs as those for field supervisory, administrative, and technical personnel, offices, shops, yards, utilities, communications, office and engineering supplies and equipment, etc., expected to be incurred at the project site but not chargeable to a specific work item.

(3) Home Office Expense. These costs will typically be included in estimates by applying an estimated percentage to the expected total field (direct plus indirect) cost amount. A contractor's home office expense rate is not fixed, but varies from period to period. It is considered a function of his total general and administrative expense for a specific period divided by his total field costs for that same period.

**h. Profit.** The estimate will include appropriate allowances for profit. For the prime contractor and for subcontractors whose work is a significant portion of the project, rates for profit allowance will be determined by the Weighted Guideline method. For less significant subcontract work, experienced percentage rates may be used. Profit may be calculated within M-CACES Gold.

**i. Bond.** Costs for performance and payment bonds, if required, will be included in the estimate. Specific rates are dependent on factors such as the type of work

to be performed, the contract amount, and the time allowed for completion. Bond cost may be calculated within M-CACES Gold.

**j. Contract Modification Estimates.** In certain instances, the A-E will be tasked to prepare estimates for a modification to an ongoing contract. Such estimates are used as a basis of negotiations with contractors for additions to or deletions from a project, or both, and will be carefully prepared in accordance with the applicable instructions in this chapter, as well as any supplemental information or instructions furnished elsewhere. Profit may be calculated within M-CACES Gold.

**k. Current Working Estimate (CWE).** The CWE is defined as the latest available programming cost estimate for a particular project, and should represent, as closely as possible, the total expected cost to complete the project. It must include the estimated contract cost as of the date of preparation, an allowance for cost growth, as applicable, an amount for contingency reserve to cover unforeseen developments during the actual work which will result in additional costs, and an allowance for Government supervision and administration (S&A). To account for any cost increases which are anticipated to occur between the estimate preparation date and the actual work period, an allowance for cost growth must be made. This will ordinarily be accomplished by using a percentage factor developed from a cost escalation index provided by the Government. Guidance for contingency allowance and S&A costs will be furnished for each project as required by the Cost Engineering Branch. Bond cost may be calculated within M-CACES Gold.

**l. Supplemental Information.** Additional specific information and guidance will be furnished as appropriate for projects which are unique or unusual or for projects outside the Continental United States.

**m. Clarification.** Should any question or doubt arise concerning the requirements, instructions, procedures, etc., described herein, the Huntsville Division, Cost Engineering Branch should be contacted through the CEHND project manager for explanation and clarification.